20 September 1965

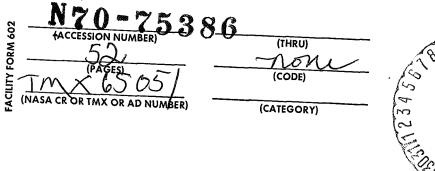
Rev. 26 October 1965

WORK STATEMENT GUIDE

FOR

RELIABILITY AND QUALITY ASSURANCE

PROVISIONS



SEP 1970
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NASA STI FACILITY
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CODE: MAR OMSF APOLLO R&QA OFFICE MANNED SPACE FLIGHT WASHINGTON, D.C.

#### INTRODUCTION

The purpose of this guide is to assist Center Contracting Officers in simplifying and clarifying the specification and degree of Reliability and Quality Assurance requirements in Requests for Proposals to potential Apollo Program contractors.

This document is a compilation of R&QA disciplines for Apollo Program Hardware and Software, and consists of three (3) basic inter-related sections.

#### SECTION I

This section consists of a series of (1) Reliability Discipline Charts and (2) Quality Assurance Discipline Charts. Each R&QA discipline is followed by one or more references to Apollo Program and/or NASA documents as the authority for that discipline. Also following each discipline are references to six designated hardware development phases. The designations correspond to those in the Apollo R&QA Program Plan, NPC 500-5. Disciplines appropriate to each phase are indicated by asterisks (\*) below the appropriate phase(s).

Based on inputs from the Center R&QA Office, the Contracting Officer may then specify on the RFP selected R&QA hardware disciplines (from the charts) and their appropriate hardware development phases that the contractor must implement on a particular contract.

#### SECTION II

This section of the guide delineates R&QA Software (documentation) requirements pertinent and necessary for the optimum performance of Apollo contracts.

R&QA Software requirements are outlined on NASA Form 1106. The first two charts list the titles, the pertinent NPC 250-1 paragraph numbers and the document classification or type of Reliability documentation. The remaining three charts list Quality Assurance documentation primarily as based on NPC 200-2, but also including reference to NPC 500-5 and NPC 400.

Preceding the R&QA Software charts is a page defining document classification (type). Documents are defined as Types I, II, III and IV corresponding to those documents requiring submission to NASA for approval, review or information, and those to be available for NASA review upon request, respectively. Also included in this section are suggested instructions and guidelines for the preparation and completion of NASA Form 1106 by the Contracting Officer. The selection and specification of appropriate R&QA documentation on the RRP is considerably simplified through the utilization of these charts by the Center C.O.

#### SECTION III

The third and last section of this guide includes representative examples of complete Work Statements for R&QA requirements that might appear in a Request for Proposal to potential contractors.

Work Statement examples define the discipline; its authority; schedules and milestones; performance specifications; documentation; and all other requirements and constraints pertinent to that discipline. The examples may also be used as a source of standard and preferred terminology, and may be used as a typical checklist of parameters to consider in the preparation of the RFP by the Contracting Officer.

This guide is based on and includes R&QA requirements of documents such as Apollo Program Development Plan NPC C500, NASA Procurement Regulation NPC 400, Apollo Documentation Administration Instruction NPC 500-6, Apollo R&QA Program Plan NPC 500-5 as well as NPC 200-2, NPC 200-3, NPC 250-1 and NPC 500-10.

## SECTION I

THIS SECTION INCLUDES RELIABILITY AND QUALITY ASSURANCE HARDWARE REQUIREMENTS BY DEVELOPMENT PHASE FOR THE APOLLO PROGRAM.

## RELIABILITY REQUIREMENTS FOR APOLLO PROGRAM HARDWARE

ITEM	RELIABILITY PROGRAM DISCIPLINES	— <b>O</b>
1	Mission Profile Analysis	
2	Reliability Goal Analysis based on the Apollo Program Specification (SE 005-001-1)	
- 3	Goal Apportionment Analysis (Subsystems and Systems)	
4	Apportionment Model Development (Hardware)	
5	Reliability Program Plan Development	
. 6	Reliability Evaluation Plan Development	
7	Program Management and Control	
8	Task Monitoring and Surveillance Organization	
9	Data Collection and Analysis	
10	Program Documentation Administration per NPC 500-6	
11	Status Reporting (Trends and Events)	0
12	Technical Reporting	
13	Prediction Model Development	
14	Analysis of Feasible Alternatives to Achieve Goals	
15	Program for Control of Government Furnished Property	
16	Program Audits (Center/Contractor/Subcontractor)	
17	Design Specification Reviews	0
18	Functional Block Diagrams	**************************************
19	Logic Diagrams	
20	i Failure Mode, Effect and Criticality Analyses	
21	Maintainability = !ysis	
22	Redundancy Requirements (Equipment, Human, Logistics)	
23	Selection of Reliability and Proven Parts and Materials	•

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		10.3	4.7a(5)		*	*	*	*	*	*	
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	(b)i,ii	10.5.4	3.4a	4.2		*(q)	*	· *			
***************************************	(b)iii		3.4b	2.4	*	i iv	*	*			
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# RELIABILITY REQUIREMENTS FOR APOLLO PROGRAM HARDWARE

ITEM,	RELIABILITY PROGRAM DISCIPLINES	
24	Lists of Approved Paris and Materials	
25	Designation of Parts Requiring Serialization and Traceability	
24	Program to Minimize Human-Induced Failures	
27	Parts and Materials Application Reviews	
28	Configuration Management Program per NPC 500-1 PARA 6.0	
29	Logistics Planning and Management per NPC 500-3	
30	Design Review Program (Contractor/Subcontractor)	•,
31	Program Requirements Invoked on Subcontractors	
32	Resident Representative Monitoring of Subcontractors	
33	Trade-off Analyses	
34	Failure Reporting, Analysis, Correction and Data Feedback System	
35	Designation of Limited Life, Operating Time & Critical Stress Items	
3&	Standardization and Control of Design and Drafting Practices	
37	Overall Test Program per NPC 500-10	
38	Parts Qualification Test Program	
39	Program Reviews	
40	Reliability Demonstration Test Program	0
41	Checkout Test Program	
40	Acceptance and Rejection Criteria Development (End-Items)	
*v'\	End-Item Acceptance Test Program	
4-4	Standardization and Control of Process Specifications	
45	Supply Requirements	
	Equipment Log Program	

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					3.10			*(n)	*(h)	*(e)	*	
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## RELIABILITY REQUIREMENTS FOR APOLLO PROGRAM HARDWARE

ITEM	RELIABILITY PROGRAM DISCIPLINES	
47	Development Test Program (Subsystems and Systems)	
48	Qualification Test Program (Subsystems and Systems)	
49	Assessment Model Development	
50	Standardization and Control of Fabrication and Assembly Practices	0
51	Training of Operators, Inspectors and Testers	
52	End-litem Reliability Audits	
53	Documentation for Certificate of Flight Worthiness	
54	Transportation Requirements	
55	Pre-Use Checkou: Program (Ground Support Equipment)	
56	Pro-Launch Checkout Program (Flight Hardware)	
57	Largund Bour Judulis Assessment	<b>-</b> O-
58	Reliability Assessment of Each Flight	
59	Mission Success and Crew Safety Assessment	
60	Documentation for Flight Readiness Review	
61	Post-Flight Test Program	
62	Flight Test Results Assessment	
63	Flight Test Results Versus Results Predicted from Ground Tests	0
64	Hardware Modifications for Reliability Improvement	
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## QUALITY REQUIREMENTS FOR APOLLO PROGRAM HARDWARE

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ITEM	QUALITY PROGRAM DISCIPLINES	
. 1	Organizations and Responsibilities	
2	Quality Assurance Requirements	
. 3	Support to Reliability Program	
4	Quality Assurance Program Plans/inspection Plans	$\circ$
5	Inspection, Measuring, & Test Equipment	
. 6	Quality Assurance Program Audit	
7	System Perf., Maint., Envir., & Test Regits. in Specifications	
8	Quality Characteristics	
9	Government Q. A. Actions	
10	Design & Specification Reviews	
11	Selection of Paris	0
12	Selection of Sources	
13	Critical litems	
14	Identification for Traceability	
15	Change & Configuration Control	
16	Special Process Controls	
17	Personnel Training	0
18	Qualification & Requalification Testing	
19	Program Reviews	
20	Data Reporting	
21	Data Analysis & Corrective Action	

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## QUALITY REQUIREMENTS FOR APOLLO PROGRAM HARDWARE

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ITEM	QUALITY PROGRAM DISCIPLINES	
.22	Preservation, Packaging, Handling, Storage, & Shipping	govidencemper Outpiero har Foreign particulos e
23 -	Quality Program Documentation Requirements	
. 24	Procurement Controls	•
25	Incoming Material Control	
25	In-process Test & Inspection	
.27	End-Item Acceptance Testing Procedures 3 Criteria	
28	Coordination of Contractor-Supplier Measuring & Test Equip. & Stds.	
29	Raw Material Control	
30	Government Furnished Property (GFP) Control	
31	Nonconforming Material Control	
32	Inspection Stamp Control	0
33	Process Certification •	
34	Personnel Certification	•
35	End-Item Acceptance Test	
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#### SECTION II

THIS SECTION INCLUDES THE DOCUMENT REQUIREMENT LIST (DRL) LISTING OF RELIABILITY AND QUALITY ASSURANCE SOFTWARE REQUIREMENTS FOR THE APOLLO PROGRAM.

PREPARATION INSTRUCTIONS FOR THE (DRL) AND THE DOCUMENT REQUIREMENT DESCRIPTION (DRD) WITH AN EXPLANATION
OF DOCUMENT TYPES ARE SHOWN ON ATTACHMENT 1.

Classification - The documentation listed herein shall be classified by types as follows:

- Type I Documentation requiring written approval by the procuring activity prior to implementation into the procurement or development program.
- Type II Documentation received by the procuring activity for <u>review</u> not later than four weeks prior to project implementation.
- Type III Documentation submitted to the procuring activity for coordination, surveillance, or information.
- Type IV Documentation, retained by the contractor, that is to be made available to the procuring activity upon request. The contractor shall furnish a list, by subject, to the procuring activity.

#### PREPARATION INSTRUCTIONS

The Document Requirements List (DRL), NASA Form 1106 should be prepared in accordance with the requirements of NPC 500-6, Apollo Documentation Instruction (ADAI).

A Document Requirements Description (DRD), NASA Form 1107 should be prepared in accordance with the requirements of NPC 500-6 for each document listed on the DRL.

INE TEM NO.	TITLE	DOCUMENT CONTROL NUMBER	RESPONDENT DOCUMENT FILE NO. OR FORM NO.	PUBLIC REPORT APPROVAL NUMBER	REQ OFFICE	FREQUENCY AND NUMBER OF COPIES	DATE DUE TO USER	AS OF DATE DAY-MO-YR
4.	, <b>5.</b> .	6. `	· 7.	8.	9.	10.	11.	12.
1	Reliability Program Plan							
	*2.2.4 Type I	RA-001			71000	9-25	60	12-6-63
2	Reliability Program Plan Revisions *2.3 Type I					1		
3	Reliability Program Control Plan *2.4 Type I							
4	Reliability Program Control Reports *5.2.3 Type II					,		
5								
6	Reliability Evaluation Program Review Rpts. *4.5 Type I	•						
7	List of Suppliers and Contractors *2.6.2 Type II							
8	Design Specifications *3.2.1 Type II		•					
9	Reliability Block Diagrams (as updated) *3.2.2 Type III							
.0	Reliability Prediction Models (as updated) *3.3 Type III	RA-003						
1		ra-006		<i>^</i>				
.2	Maintainability and Human-Induced Failure Reports *3.5 Type III	• .	<u> </u>	100				
3	Design Review Reports *3.6.1 Type II		1/2/	7				
4	Failure and Corrective Action Summaries *3.7 Type III	RA-012	640					
5	Parts & Materials Program Progress Reports *3.9 Type III	~ 1 Ps	1		-			
	Parts and Materials Specifications *3.9.3 Type II	No Po						
7	Parts and Materials Qualification Test Specifications #3.9.4 Type II	112						
8	Parts & Materials Qualification Status Lists *3.9.4 Type I	RA-016		·				
9	Approved Parts and Materials Lists *3.9.5 Type III	RA-014					·	
0	Parts and Materials Application Reviews *3.9.6 Type II				1			
ī	Equipment Logs				<del>                                     </del>			
2	*3.10 Type IV Test Specifications							
	*4.3.3a, Type II REPARED BY (NAME AND TITLE)	16. DATE PREPARED		OVED BY (NAM		1	1	<u> </u>



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3	Test Procedures								
	*4.3.3b. Type II						<u> </u>		
- 1	Test Reports *4.3.3c, Type III								
5	Reliability Assessment Models *4.4. Type III								
6	Reliability Progress Reports - Weekly	III				-		·	
7	Reliability Progress Reports - Periodic								
	Progress *5.2.2 Type	III					<u> </u>		·
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4.	5.	6.	7.	8.	9.	10.	11.	12.
	Insp., Measurg. & Test Equip. Eval. Repts. *9.4 Type II	RA-017						
124	Quality Status Reports *14.2 Type III							
125	Laboratory & Experimental Data *14.2 Type III							
126	Failure Data *14.1, 14.3 Type III							
J27	Limited & Critical Life Article Data *7.5.2, 14.1 Type IV		) 1					
J28	Quality Program Perfor. Audit Repts. *15.2 Type IV		1					
29	Quarterly Summaries of Audit Repts. *15.2 Type III		1					
130	Operational Data *14.2 Type III							
131	Records for Traceability *5.7, 7.5.2 Type IV	1.6					***************************************	
	End-Item Test Plan							
133	*7.4.2.1 Type I End-Item Test & Insp. Procedures							
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2	Quality Program Plan  *3.1.1, 7.3 NPC 500-5 Para.4.4 Type I	RA-007						
3	Supplier Inspection Plans NPC 400 Para. 1.5005 Type I	RA-005						
4	Subcontractor Quality Program Plans NPC 400 Para. 1.5005 Type I	RA-007	<u> </u>					
5	Design Review Records *4.2.1 Type IV							
6	Qualif. & Requalif. Test Procedures *4.3.1, 4.3.4, 7.3.1 Type II			·				
7	Qualification Test Records *4,3,1, 4,3,4, 14,2 Type III					·		
8	Qualification Status List *4.3.5 Type I					·		
9	Preferred Source Lists *5.9 Type IV							
τ0	Supplier Quality Records *5.2.1, 5.3.1, 5.2.2 Type IV							
11	Survey Reports *5.2.1 Type IV							
	Procurement Documents *5.3 Type IV							
13	Test & Inspection Procedures *7.3.1 Type II		·					
14	Test & Inspection Records *14.2 Type III				·			
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	Process Control Procedures *7.5.4.1 Type II							
	Process Certification Records *7.5.4.3 Type IV				<u> </u>			
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4	Test & Inspection Records *3.13 & 3.5 Type IV							
5	Source Inspection & Test Data *3.1 Type IV					·		
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7	Process Control & Inspection Records *3.7 Type IV							
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## SECTION III

THIS SECTION INCLUDES REPRESENTATIVE EXAMPLES OF RELIABILITY AND QUALITY ASSURANCE WORK STATEMENTS INCLUDED IN REQUESTS FOR PROPOSALS.

#### WORK STATEMENT

#### 1.0 RELIABILITY

#### 1.1 General

The contractor shall develop and implement a reliability program plan in accordance with the proviisons of NPC 250-1 and instructions contained in the following paragraphs. This reliability program plan, when approved in writing by the contracting officer, shall become a part of the Work Statement of the contract.

The object of the reliability program shall be to assure that the probability of successful performance of the technical requirements as specified (in appendix x) is 0. at % confidence.

(If additional reliability goals are desired, they should be inserted here)

#### 1.2 NPC 250-1 Definitization

#### 1.2.1 General

Wherever the term "cognizant NASA installation appears in NPC 250-1, it shall mean (MSC - ASPO - R&QA).

- 1.2.2 Specific paragraphs of NPC 250-1

  The following instructions refer to specific paragraphs of

  NPC 250-1 as indicated.
  - 2.3 Reliability program reviews shall be conducted each

    (January and July) as well as at major milestones
    in the program and as requested by the contractor.
  - 2.4 (Give specific guidance on those aspects of control for which the NASA installation has special requirements and, if appropriate, for the preferred system of control.)

- 2.6 (List those elements of the system considered by NASA to be "Major" in terms of the need for reliability control by a formal reliability program. The list may be identified as "suggested" where it is desired to obtain contractor inputs for subsequent negotiation.)
- 2.6.3 (Indicate those of the system elements listed as "major" which are considered by NASA to require use of resident prime contractor representatives in subcontractor facilities. This list may be identified as "suggested" where it is desired to defer the final decision until specific information on subcontracts is proposed.)
- 2.7 Components and subsystems which will be furnished to the contractor by NASA for inclusion in his equipment are identified in \_\_(Table X\_\_. Operating and physical characteristics and necessary reliability data are also included in \_\_(Table X)\_\_\_.
- 3.2.1 (It is possible that "mission profile performance requirements" may not be appropriate for use with this contract.

  If so, amend the statement to read "operational performance requirements".
- 3.2.2 The maximum period between submitting updated functional block diagrams shall not exceed (three months).
- 3.3 (Specify the milestone or time at which the initial prediction is required and the succeeding rajor or intermediate milestones at which revised predictions are required. Also, if appropriate, prescribe the method of prediction to be used and furnish detailed supplemental guidance.)

- 3.4 a) A Failure Mode and Effect Analysis (FMEA) shall be performed on end item equipment design in accordance with NPC 250-1 Paragraph 3.4 or (applicable Center documents).
  - b) A criticality analysis by criticality class or number shall be performed on each end item equipment design in accordance with (applicable Center Document).
- 3.5 The contractors efforts concerning Maintainability and Elimination of Human Induced Failures shall be based on MIL-M-26512B
  and MIL-STD-803.
- 3.7 (If a specific format and numbering system is desired, so specify.)
- 3.8 Modifications to the contractors existing standards and specifications will be kept to a minimum, consistent with equipment requirements. NASA Design Criteria to be incorporated in the contractor's and subcontractor's design standards systems is contained in Appendix X. (or) there is no requirement to incorporate NASA Design Criteria in the contractor's or subcontractor's design standards systems.
- 3.9.1 (On some contracts, it may not be desirable to have the contractor establish a group of parts and materials specialists. In such cases, indicate that paragraph 3.9.1 is not a requirement.)
- 3.9.2 (Table X) Lists parts already proven on other systems. The contractor shall use these parts where applicable so as to limit the scope of his parts selection effort.

- 3.9.3 (Table X) Lists the specifications for parts already proven on other systems, or Table X lists the specifications (for parts already proven in other systems) provided with this requirement.
- 4.3.4 Reliability demonstration tests will be conducted in accordance with section 3.7 of NPC 500-10. The Reliability Evaluation Plan shall identify all items of hardware and the number of each type to be subjected to reliability demonstration tests.
- 4.4 Reliability assessments shall be scheduled and performed

  (at 3 month intervals) . The assessments shall be an up
  dating of the predictions of paragraph 3.3 of NPC 250-1
- The contractor shall furnish or have available the documentation listed in the "Document Requirements List" (DRL),

  NASA form 1106. This list will be accompanied by a specific

  "Document Requirement Description" (DRD) for each document on the DRL. (See Examples)

The references to types of documentation in the title column are explained in Attachment I.

#### QUALITY ASSURANCE PROVISIONS

#### NPC 200-3 CONTRACTS

1.1	"Wherever	the phrase	'cognizant N	ASA installatio	n' is	used,	iţ
				•			
	shall mean	(NASA Cent	er governing	the procuremen	<u>t</u> )."		

- 1.2 "The Supplier shall establish and maintain an inspection system which satisfies the requirements of NASA Quality Publication NPC 200-3 'Inspection System Provisions for Suppliers of Space Materials, Parts, Components and Services'."
- 1.4 "Detailed reliability requirements are stated in the Reliability Section of this work statement (Section ).
- 1.5 When inspection plans for specific subcontractors or for subcontractors of specific equipment are required to be transmitted through the prime contractor to the (NASA Center) for review or approval, the subcontractors or equipment shall be listed. Transmittal of these plans shall be in accordance with the Document Requirements List (DRL).

Example: "The following subcontractors are required to submit inspection plans to the (prime contractor) for transmittal to the (NASA Center):"

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- 2.2 "The supplier shall prepare and maintain a written inspection plan which shall be submitted to the (NASA Center) in accordance with the Document Requirements List (DRL), NASA Form 1106 which is a part of this work statement (Appendix \_\_\_)."
- 3.1 "When the prime contractor invokes NPC 200-3 in subcontracts, the subcontractor shall furnish the required documentation to him. The prime contractor shall forward copies to the (NASA Center) or its designated representative in accordance with the DRL."

"An equivalent specification proposed by the prime contractor in lieu of NPC 200-3 for procurements, shall be submitted to the (NASA Center) for review at least two weeks prior to its use in procurement documents."

When so required by the procuring agency for off-the-shelf and commercial items, the following statement shall be included in the work statement:

"All receipts at the contractor's plant, including off-the-shelf' and commercial items, shall be clearly identified and this identity maintained in storerooms and during processing in order that items procured under NASA contract may be readily recognized."

- 3.3 When it is anticipated or determined that Government Furnished Property (GFP) will be furnished to the supplier, specific instructions regarding the testing, inspection and handling of the GFP shall be included in the work statement. Also, when GFP is to be used as is without further inspection or testing, this shall be stated.
- 3.5 "Suppliers of fabricated articles shall supply test specimens of raw materials with the fabricated articles for verification tests as required by the (NASA Center)."
- 3.6 Inspections and tests desired but not contained in specifications and standards referenced in this work statement shall be stated.
- 3.7 Any special processes such as plating, anodizing, radiography, magnetic particle and liquid penetrant inspection, heat treating, welding, soldering, etc., and/or equipment which are required to be approved or certified shall be stated. Any requirements for personnel certification shall be stated.
- 3.11 Any special packing and marking requirements that differ from ICC Regulations shall be stated.
- 3.12 Requirements for sampling inspection, if applicable, or special instructions for screening inspection in lieu of sampling shall be stated.
- 3.13 Requirements for mechanical or electronic data processing shall be stated.

#### QUALITY ASSURANCE PROVISIONS

#### NPC 200-2 CONTRACTS

- 1.2 "Wherever the phrase 'cognizant NASA installation' is used, it shall mean (NASA Center governing the procurement)."
- 1.2 "The contractor shall establish and maintain an effective quality program to satisfy, as a minimum, the requirements of NASA Quality Publication NPC 200-2, 'Quality Program Provisions for Space System Contractors'."
- 1.2 When the provisions of NPC 200-2 are to be applied to specific major subcontracts, the contract shall state the subcontractor and/or equipment to which this provision applies.
- 1.4 "Detailed reliability requirements are stated in the Reliability section of this work statement (Section \_\_\_\_)."
- 1.5 When quality program plans for specific subcontractors or for subcontractors of specific equipment are required to be transmitted through (prime contractor) to the (NASA Center) for review or approval, the subcontractor or equipment shall be listed. Transmittal of these plans shall be in accordance with the Document Requirements List (DRL). Example: "The following subcontractors are required to submit quality program plans to (prime contractor) for transmittal to the (NASA Center):

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- 4.4 A listing of all generic items that do not require serialization of identification by lot number after fabrication shall be included in the work statement.
- 5.1 Any waiver of contractor responsibility for certain specific procured items shall be stated; e.g.

"Contractor responsibility is waived for the adequacy and quality of the following items and articles."

5.3.1 "When the prime contractor invokes NPC 200-2 or NPC 200-3 in subcontracts, the subcontractor shall furnish required documentation to him. The prime contractor shall forward copies to the (NASA Center) or designated representative in accordance with the DRL.

An equivalent quality requirements document proposed by the prime contractor in lieu of NPC 200-3 for procurements shall be submitted to the (NASA Center) for review at least two weeks prior to inclusion in procurement documents."

5.7 When so required by the procuring agency for "off-the-shelf" and commercial items, the following shall be included in the work statement:

"All receipts at the contractor's plant, including
'off-the-shelf' and commercial items, shall be clearly
identified and this identity maintained in storerooms
and during processing in order that items procured under
NASA contract may be readily recognized."

- 2.2 "Quality Program Documentation shall be prepared and submitted as defined in the Document Requirements List (DRL) NASA Form 1106 which is a part of this work statement (Appendix \_\_\_)."
- 3.1.1 "The preliminary Quality Program Plan shall be prepared according to the requirements of NPC 200-2, Paragraph 3.1.1 and submitted with the proposal in accordance with the DRL.

The final Quality Program Plan is a detailed amplification of the preliminary plan and shall be submitted after contract award in accordance with the DRL."

- 4.2.2 "Applicable preferred parts lists to be included in this contract are attached as Appendix \_\_\_\_." When the contractor is required to establish preferred parts lists, the types of parts shall be described in the work statement.
  - 4.3.1 Any additional requirements beyond NPC 200-2, Paragraph 4.3.1, for documentation and submittal of qualification test procedures shall be described.
  - 4.3.5 "The qualification status lists shall be submitted for approval to the (NASA Center) initially and at intervals in accordance with the DRL."
- 4.4, When electronic or mechanized data processing is required by the 14.2.1 procuring agency, the requirements for such data processing shall be defined in the work statement.

- One of the GFP shall be included in the work statement. Also, when GFP is furnished to be used as is without further testing and inspection, this shall be stated.
- 11.6e Any special packing and marking requirements that differ from the ICC rules and regulations shall be stated.

  - 14.3 The extent of laboratory facilities to be established and failure analysis function to be performed by the contractor at the launch site shall be stated. Time periods for notification of failures and malfunctions and for initiation of corrective action shall be stated.

WORK STATEMENT MANUAL
REQA REQUIREMENTS

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MAY 18, 1966

### 4.0 <u>R&QA Requirements</u>

The succeeding paragraphs indicate contractual requirements necessary for development and implementation of an R&QA Program.

There are 3 sections covering general R&QA requirements, specific Reliability oriented requirements and specific Quality oriented requirements. In some cases suggested samples of specifically worded contract items are included; in the remainder of cases, the contract requirement is explained with the wording left up to the contract author.

### 4.1 General Requirements

### 4.1.1 Program Plan

Indicate the basis for the program plan as well as any special instructions and exceptions. The following wording is suggested:

"The contractor shall develop and implement an R&QA Program Plan in accordance with the provisions of NPC 250-1, NPC 200-2, the \_\_\_(Program name) \_\_\_ R&QA Program Plan and instructions and exceptions in following paragraphs of this article (article\_\_\_\_). This contractor R&QA Program Plan, when approved in writing by the contracting officer, shall become a part of the Work Statement of this contract. If conflict exists between the provisions of any of the above mentioned documents and those of the approved contractor R&QA Program Plan, the latter shall have precedence."

### 4.1.2 Reliability Goal

Where hardware is involved there will undoubtedly be a Reliability

Goal requirement. The following wording is suggested:

that the probability of successful performance of the contractual end-item(s) in accordance with technical requirements as specified in \_\_\_(indicate performance specification numbers) is 0. from (starting point of operation performance) for (period of operation) at \_\_\_\_\_\_% confidence." (If additional reliability goals are desired, they should be inserted here). 4.1.3 Cognizant NASA Installation As long as NPC 250-1, NPC 200-2 and NPC 200-3 govern R&QA activities of the contractor, the following statement should appear in the contract: "Wherever the term "cognizant NASA installation" appears in NPC 250-1, NPC 200-2 or NPC 200-3, it shall mean (Insert NASA Center governing the procurement) ." 4.1.4 Program Reviews (Reference NPC 250-1, par. 2.3) Specify the frequency of R&QA Program reviews as follows: "R&QA program reviews shall be conducted at least (indicate bi-annual, quarterly, monthly, or whatever frequency is desired), as well as at the following major milestones: (identify the milestones) . Additional reviews will be scheduled when requested by the customer." 4.1.5 Program Control (Reference NPC 250-1, para. 2.4; and NPC 200-2, para. 3.2) Give specific guidance on those aspects of Program Control for which the NASA Procurement governing agency has special requirements and, if appropriate, indicate the preferred system of control.

"The object of the Reliability Program shall be to assure

#### 4.1.6 Documentation

(Reference NPC 250-1 para. 5.1; and NPC 200-2, para. 2.2).
The following is suggested wording:

"The contractor shall furnish or have available the documentation listed in the Document Requirements List (DRL), NASA Form 1106, (Appendix \_\_\_\_\_ of the work statement). This list will be accompanied by a specific Document Requirement Description (DRD) for each document on the list."

## 4.1.7 Reporting Requirements

(Reference NPC 250-1, para. 5.2 & 5.3; and NPC 200-2, para. 14.2).

Reporting requirements for the R&QA Program may be detailed in the R&QA requirements or they may be listed in another article of the contract, or they may appear in both places. Wherever they appear, be sure that any requirements in addition to those listed in NPC 250-1 and NPC 200-2 are noted and described as to content, frequency and recipient. If the requirements appear in more than one place, they should be cross-referenced.

# Specific Reliability Oriented Requirements

#### 4.2.1 Reliability Math Models

4.2

(Reference NPC 250-1, para. 3.3, & 4.4).

The following wording is suggested:

"The contractor shall develop and maintain Reliability math models and shall use these models as a basis for

making Reliability predictions, apportionments and
assessments. The models will consider(indicate
the eqpt. level(s) to be considered, e.g., subsystem.
system, component, etc.) . Details of "Apollo
Reliability Analysis Review and Estimation Guidelines"
(RA 006-007-1) shall be considered in the development
and maintenance of the models. The models and their
input data shall be reviewed and verified by the
(insert the name of the NASA Center governing the
<pre>procurement) at least every (indicate</pre>
frequency of reviews) . The models will be updated
every
Functional Block Diagrams
(Reference NPC 250-1, para. 3.2.2).
The following wording is suggested:
"The maximum period between submitting updated functional
block diagrams shall not exceedmonths."
Reliability Predictions & Assessments
(Reference NPC 250-1, para 3.3 & 4.4)
Specify the milestone or time at which the initial prediction
is required and the succeeding major or intermediate milestones

4.2.2

4.2.3

Spec is r at which revised predictions are required. Also, if appropriate, prescribe the method of prediction to be used and furnish detailed supplemental guidance. Indicate that reliability assessments will be updates of reliability predictions and indicate the frequency of performance of such assessments.

4.2.4 Special Reliability Controls

(Reference NPC 250-1, para. 2.6)

List those elements of the system considered by NASA to be "major" in terms of the need for special reliability control by a formal reliability program. The list may be identified as "suggested" where it is desired to obtain contractor inputs for subsequent negotiation.

Indicate those elements of the system considered by NASA to be "major" so as to require the use of resident prime contractor representatives in subcontractor facilities. This list may be identified as "suggested" where it is desired to defer the final decision until specific information on subcontracts is proposed.

4.2.5 Failure Mode, Effect, & Criticality Analysis

(Reference NPC 250-1, para. 3.4)

Insert the following words:

"A criticality analysis by criticality class=of number shall be performed on each end item equipment design in accordance with (applicable NASA Center Document)."

4.2.6 <u>Mission Profile</u>

(Reference NPC 250-1 para. 3.2.1)

It is possible that "mission profile performance requirements"

may not be appropriate for use with this contract. If so,

amend the statement to read "operational performance requirements."

4.2.7 Standardization of Design Practices

(Reference NPC 250-1, para. 3.8)

Modifications to the contractors existing standards and specifications will be kept to a minimum, consistent with

By number only

equipment requirements. Use either of the following two suggested wordings:

"NASA Design Criteria to be incorporated in the contractor's and subcontractor's design standards systems is contained in Appendix \_\_\_\_\_\_

"There is no requirement to incorporate NASA Design

Criteria in the contractor's or subcontractor's design

standards systems."

# 4.2.8 Parts & Materials

(Reference NPC 250-1 para. 3.9.1, 3.9.2, & 3.9.3; and NPC 200-2 para. 4.2.2).

On some contracts, it may not be desirable to have the contractor establish a group of parts and materials specialists. In such cases, indicate that paragraph 3.9.1 of NPC 250-1 is not a requirement. The following additional wording is suggested:

"A list of preferred parts already proven on other systems is included in \_\_\_\_\_\_\_ (note the appropriate \_\_\_\_\_\_\_ appendix or table No.) \_\_\_\_\_. The contractor shall use these parts where applicable so as to limit the scope of his parts selection effort. When the contractor is required to establish additional preferred parts lists, the types of parts shall be described in the work statement."

## 4.2.9 <u>Reliability Demonstration Tests</u>

(Reference NPC 250-1 para. 4.3.4)

The following wording is suggested:

"Reliability demonstration tests will be conducted in accordance with section 3.7 of NPC 500-10. The Reliability Evaluation Plan (per NPC 250-1 para. 4.2) shall identify all items of hardware and the number of each type to be subjected to reliability demonstration tests."

# 4.3 Specific Quality Oriented Requirements

4.3.1 <u>Inspection System</u>

(Reference NPC 200-3 para. 1.2 and 2.2)

The following wording is suggested:

"The contractor shall develop and implement an Inspection Plan in accordance with the provisions of NPC 200-3. This Inspection Plan shall be a part of the Quality Program Plan. If conflict exists between the provisions of NPC 200-3 and those of the approved Inspection Plan, the latter shall have precedence."

# 4.3.2 <u>Subcontractor Quality/Inspection Plans</u>

4.3.2.1 (Reference NPC 200-2 para. 1.5 and NPC 200-3 para. 1.5)

When Quality/Inspection program plans for specific subcontractors or for subcontractors of specific equipment are
required to be transmitted through (prime contractor) to
the (NASA Center) for review or approval, the
subcontractor or equipment shall be listed. The following
wording is suggested:

	"The following subcontractors are required to submit
	(Quality and/or Inspection) program plans to
	(prime contractor) for transmittal to the
	NASA Center):
	(name of subcontractor)
	(name of subcontractor)
	(name of subcontractor)
4.3.2.2	(Reference NPC 200-2 para. 5.3.1 and NPC 200-3 para. 3.1)
	When the prime contractor invokes NPC 200-2 or NPC 200-3 in
	subcontracts, the subcontractor shall furnish the required
	documentation to him. The prime contractor shall forward
	copies to the <u>(NASA Center)</u> or its designated
	representative in accordance with the DRL.
4.3.2.3	(Reference NPC 200-2 para. 5.3.1 and NPC 200-3 para. 3.1)
	If an equivalent specification is proposed by the prime con-
	tractor in lieu of NPC 200-3 for procurements, it shall be
	submitted to the(NASA Center) for review at least
	two weeks prior to its use in procurement documents.
4.3.2.4	(Reference NPC 200-2 para. 1.2)
	When the provisions of NPC 200-2 are to be applied to specific
	. major subcontracts, the contract shall state the subcontractor
	and/or equipment to which this provision applies.
4.3.3	Off-the-Shelf and Commercial Items
	(Reference NPC 200-2 para. 5.7 and NPC 200-3 para. 3.1)
	When so required by the procuring agency for off-the-shelf and
	commercial items, the following statement is suggested to be
	included in the work statement:

"All receipts at the contractor's plant, including

'off-the-shelf' and commercial items, shall be clearly

identified and this identity maintained in storerooms

and during processing in order that items procured under

NASA contract may be readily recognized."

## 4.3.4 Government Furnished Property (GFP)

(Reference NPC 250-1 para. 2.7, NPC 200-2 para. 6.1 and NPC 200-3 para. 3.3)

When it is anticipated or determined that Government Furnished Property (GFP) will be supplied to the contractor, specific instructions regarding the testing, inspection, and handling of the GFP shall be included in the work statement. Also, when GFP is furnished to be used as is without further testing and inspection, this shall be stated.

With respect to GFP the following wording is also suggested:

"Components and subsystems which will be furnished to the contractor by NASA for inclusion in his equipment are identified in \_\_\_\_(Table X) \_\_\_\_. Their operating and physical characteristics and necessary reliability data are also included in \_\_\_\_(Table X) \_\_\_\_."

#### 4.3.5 <u>Failure Reporting</u>

(Reference NPC 250-1 para. 3.7 and NPC 200-2 para. 14.3)

if a specific format and numbering system is desired, so specify.

The extent of laboratory facilities to be established and failure analysis function to be performed by the contractor at the launch site shall be stated. Time periods for

notification of failures and malfunctions and for initiation of corrective action shall be stated.

#### 4.3.6 Waiver of Contractor Responsibility

(Reference NPC 200-2 para. 5.1)

Any waiver of contractor responsibility for certain specific procured items shall be stated, e.g. the following wording is suggested:

"Contractor responsibility is waived for the adequacy and quality of the following items and articles:

	<u>article)</u>	of	(name	
	article)	of	(name	
• 11	article)	of	(name	

## 4.3.7 Process Control

(Reference NPC 200-2 para. 13.2 and NPC 200-3 para. 3.7)

Any special processes such as plating, anodizing, radiography, magnetic particle and liquid penetrant inspection, heat treating, welding, soldering, etc., and/or equipment which are required to be approved or certified shall be stated.

Any requirements for personnel certification shall be stated.

## 4.3.8 Packing & Marking

(Reference NPC 200-2 para. 11.6e and NPC 200-3 para. 3.11)

Any special packing and marking requirements that differ from ICC Regulations shall be stated.

#### 4.3.9 Part Identification

(Reference NPC 200-2 para, 4.4)

A listing of all generic items that do not require serialization of identification by lot number after fabrication shall be included in the work statement.

4.3.10 Qualification Test Procedures

(Reference NPC 200-2 para. 4.3.1)

Any additional requirements beyond NPC 200-2, Paragraph 4.3.1, for documentation and submittal of qualification test procedures shall be described.

4.3.11 Qualification Status Lists

(Reference NPC 200-2 para. 4.3.5)

The following wording is suggested:

"The qualification status lists shall be submitted for approval to the <a href="NASA Center">(NASA Center)</a> initially and at intervals in accordance with the DRL."

4.3.12 Verification Tests of Raw Materials

(Reference NPC 200-3 para. 3.5)

The following wording is suggested:

"Suppliers of fabricated articles shall supply test specimens of raw materials with the fabricated articles for verification tests as required by the \_\_(NASA Center)."

4.3.13 <u>Inspection & Tests</u>

(Reference NPC 200-3 para. 3.6 and 3.12)

Inspections and tests desired but not contained in specifications and standards referenced in this work statement shall be stated. Requirements for sampling inspection, if applicable, or special instructions for screening inspection in lieu of sampling shall be stated.

4.3.14 <u>Electronic Data Processing</u>

(Reference NPC 200-2 para. 4.2.1 and 4.4; and NPC 200-3 para. 3.13)

When electronic or mechanized data processing is required by the

procuring agency, the requirements for such data processing shall be defined in the work statement.

Matrix of R&QA Requirements for Apollo Program Hardware

The following pages show a series of R&QA Discipline Charts. Each R&QA discipline is followed by one or more references to Apollo Program and/or NASA documents as the authority for that discipline. Also following each discipline are references to designated hardware development phases. The designations generally correspond to those in the Apollo R&QA Program Plan, NHB 5300.1 of October 1965. Disciplines appropriate to each phase are indicated by asterisks (\*) below the appropriate phase(s).

may then specify on the RFP selected R&QA hardware disciplines (from the charts) and their appropriate hardware development phases that the contractor must implement on a particular contract.

# Have never seen NHB 5300.1-May be Competible

		RELIAB	ILITY & QUAL	ITY ASSURANC		NTS FOR APOLL	O PROGRAM HA	RDWARE				<u> </u>	$\checkmark$				
I TEM	R&QA PROGRAM DISCIPLINE	NPC 500-10	NPC 400 Para. 1.5106	NPC 400 Subpart 50	NPC C500	NHB 5300.1	NPC 250-1	NPC 200-2	NPC 200-3	STUDY	NO	DESIGN	DEVELOPMENT A	MANJIRCTURIN G	TEST TH	- 1	SUPPORT SERVICES
1.	REQA Program Plan (Including Inspection Plan)		(b) i, ii	1.5005	10.5.4	2.2.2a 2.2.3a 3.4	2.2	3.1,1	2.2	*	*	*	*	*	*		
2.	R&QA Program Management & Control		(b) iii		1.2 10.5.4 10.6.3 10.7	3.4b	2.4	3.2		Tr.	*	7:	*	*	*	*	*
3.	R&QA Program Requirements			1.5005	10.3 10.6	Sect. 2	Sections 2, 3 & 4	1.2	1.2	*	*	*	*	*	*	*	*
4.	R&QA Documentation Adm. & Reqmts.		(a) iv	1.5005	4.2	2.3.9	5,1	2.2 14.1 14.2 App. B	1.1, 2.2, 3.6, & 3.13	*	*	*	*	*	*	*	*
5.	REQA Program Reporting Requirements		(b) xiii		10.6.12	2.2.8b, 5.4, 5.5	5.2 5.3	14.2.1 14.2.4		*	*	*	*	rk	*	*	*
6.	REQA Program Reviews					2.2.3w 3.2.4f	2.3					*	*	*	*	*	*
7.	R&QA Program Audits & Monitoring		(a) (b) v		10.6.12 10.7	2.2.8d Sect. 6	2.1 2.3,2.4 2.6.3 3.2	Sect. 15				*	*	*	*	*	*
8.	Design Reviews (R&QA Participation)				10.6.4	2.2.3 p,w 2.2.4 f 2.2.7 d	3,2 3,6	4.2.1				*	*	*	*		
9.	Review Design Practices, from R&QA Standpoint, for Standardization		(a) ii				3,8					rk	*				
10.	Configuration Management (per NPC 500-1, 6.0) as related to R&QA				5.2	2.2.3x 2.2.4c 2.2.5b 2.2.6c 2.2.7d 2.3.7	3.6.3	2.3	2.4		*	*	*	*	*	*	
11,	Data Collection & Analysis (Rellab.&Qual and Test as related to R&QA)	6.4	(a) Iv	1.5005	10.6.6 10.6.9 10.6.11	2.2.8a 2.5 4.7 7.3.3 7.4.7 7.5	5.1	Sect. 14	3.14			*	*	*	*	*	*

			•		AUT	HOR1 TY					ARDW.	ARE	DEVEL	OPMEN	IT PH	ASE	
I TEM	R&QA PROGRAM DISCIPLINE	NPC 500-10	NPC 400 Para. 1.5106	NPC 400 Subpart 50	NPC C500	NHB 5300.1	NPC 250-1	NPC 200-2	NPC 200-3	STUDY	DEFINITION	DESIGN	DEVELOPMENT	MANUFACTURING	TEST		SUPPORT
12,	Logistics (NPC 500-3) as related to R&QA (Maintenance, Supply, Transportation - Preservation, Packaging, Handling, Storage & Shipping)		(a) 1		Sect. 6 10.6.3	2.2.3k 2.2.6b 2.3.8	3.5	Sect. 11	3.4 3.11					*	*	*	
13.	Training & Motivation (R&QA), (including Personnel Certification)				10.6.13	2.2.4a 2.2.8c 2.3.2c	2,5 3.5b	Sect. 13	3.7			*	*	ή¢	*	×	*
14.	R&QA Analysis of Operational & Pre-launch considerations (Opn'l gnd. rules; contingency plans concerning countdown, holds scrubs, aborts, and alternative missions; pre-launch troubles; constraints, walvers, deviations, modifications, discrepancies; and adequacy of corrective actions)				10.4 10.6.1 10.6.9	2.2.6h 2.2.6f Sect. 4	·								ik	*	
15.	FRR's (R&QA Participation)				14.7.2.5	2.2.6j										*	
16.	Relationship of Quality to Reliability			1.5005	10.4	2.3.3 2.3.4		1.4	1.4	*	*	*	*	*	*	*	*
17.	Parts & Materials Program		(b) 1x, 1	1.5005	10.6.5	2.2.3m Sect. 7	3.9.2 3.9.5 3.9.6	4.2.2				*	*	*	*		*
18.	Mission Profile Analysis				10.6.1	2.2.3c 2.2.6g 4.7a(1)	3.2.1				*	it	×	*	71*	*	
19.	Reliability Goals & Apportionment				10.3 10.6.8	2.2.2c 2.2.3g 2.3.6 4.2 b (1) 4.7 a (5)					ж	*	ጵ	*	*		
20.	System/Functional, Logic/block diagrams and Math Model.	,	(b) vii		10.6.9	2.2.2b 2.2.3b, c, e 2.2.4h, i Sect. 4	3.2.2 3.3 4.4					*	*	*	*	*	
21.	Reliability Predictions & Assessments	2.2.6			10.6.8 10.6.9 10.7	2.2.2b 2.2.3e 2.2.4 i 2.2.6 i Sect.4	3.3 4.4					*	*	*	ж	*	
22.	Reliability Evaluation Program	2.2.6	(b) 1,11		10.5.4	2.2.3q 3.4	Sect. 4							*	*	*	

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I TEM	REQA PROGRAM DISCIPLINE	NPC 500-10	NPC 400 Para. 1.5106	NPC 400 Subpart 50	NPC C500	NHB 5300.1	NPC 250-1	NPC 200-2	NPC 200-3	удлу	DEFINITION	DESIGN	DEVELOPMENT	(1)			SUPPORT
23.	Analysis of feasible alternatives to achieve goals; trade-off studies.				10.6.8	2.2.2d 2.2.3f 2.2.7d Sect. 4	3.3 3.4					*	*	*	*	*	rk
24.	Failure Mode, Effect & Criticality Analysis (FMECA); and determination of critical items (including GSE).				10.6.2 10.6.4 10.6.10	2.2.3d 2.2.3o 2.2.4g 2.7 4.7a(6), (7) 7.5.3f, g	3.4					*	**	×	*		
25.	Redundancy Reqmts. (Eqpthuman-logistics)				10.6.8	2.2.3j	3.3					*	*	*	*		
26.	Program to minimize human-induced failures.		(a) i			2.2.31 2.6.1a	3.5					*	*	*	ήt		
27.	Maintainability Analysis		(a) î		<u> </u>	2.2.3k	3.5					*	*	*	*		厂
28.	Post-Flight Reliab, Analysis & Evaluation	4.3.9 4.3.10 4.3.11				2.2.5j 2.2.7 2.6.2										*	
29.	Parts Identification & Traceability			1.5005	10.6.5	2.2.3n 7.2e 7.4.2 7.4.10		4.4 5.7						*	*		
30.	Control of raw material, purchased parts, GFE, and incoming material; and selection of procurement sources.		(b) vi	1.5005	10.6.3	2.2.3r 2.2.3s 2.2.4b 7.4.5	2.7	5.2,5.3.1, 5.4,5.5,5.6 5.7,6.1,6.2	3.1, 3.3, 3.4, 3.5, 3.6				*	*			
31.	Failure reporting, failure analysis & corrective action (including UCR's)	6.5	(b) vIII		10.6.5 10.6.6 10.6.11	2.2.3t 2.2.4m 2.2.5g,J 2.2.6f 2.2.7c 2.6 5.2.3 7.4.7	3.7	5.8 6.2 Sect. 14						*	*	*	
32.	Statistical Q.C. & Sampling				10.6.5			4.2.1 Sect. 12						*	*		
33.	In-process Inspection			1.5005		2.2.3s 2.2.4b 2.2.5a 2.2.6a 7.4.9		7.3 7.4	3.6					*			

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I TEM	R&QA PROGRAM DISCIPLINE	NPC 500-10	NPC 400 Para. 1.5106	NPC 400 Subpart 50	NPC C500	NHB 5300.1	NPC 250-1	NPC 200-2	NPC 200-3	STUDY	DEFINITION	DESIGN	DEVELOPMENT	MANUFACTURING	TEST	OPERATIONS SUPPORT
34.	Control & Standardization of Processes & Process Specs; and Process Certification					2,2,3r 7,4,8	3.8	4.4 7.5.4	3.7					*	*	
35.	Standardization & Control of Fabrication & Assembly Practices					2.2.3r 7.4.8	3.8	7.3 7.4 7.5						'n	#c	
36.	Inspection Stamp Control					2.2.3s 2.2.4e 2.3.2b		5.7 Sect. 10	3.10					*	*	
37.	Non-Conforming Mat'l & MRB Action				10.6.3	2.2.4d 2.2.6f		Sect. 8 10.1a	3.8					*	ήt	
38.	Equipment Logs					2, 2, 4n 2, 2, 5h 2, 2, 6e	3.10							**	*	
39.	Maint. & Calibration of Inspection, Measuring & Test Equipment	3.3.8.2			10,6,3	2.2.3r 2.3.11	3.10f 4.3.3b	5.10 Sect. 9	3.9					*	*	
40.	Govt. Q. A. Activity	1.3 2.2.8			10.2.2 10.2.5 10.3.2 10.5.3 10.6.6 10.6.7	2.2.4d 2.2.4o 2.3.4 2.4.5 3.3 5.4 6.3.6	1.4.1	1.5 5.3.1b 5.4 8.2	1.5			*	rk	*	*	
41.	Parts Qualification Test Program				12.4.1 12.4.2	2.2.3v 2.2.4j 2.2.5c 2.2.6e 7.4.6	3.9.4					*	*	*	*	
42.	Reliab, Demonstration Test Program	2.4.4 3.7	(b) xi		10.6.6 10.4 12.4.3	2.2.3v 2.2.4k 2.2.5d 2.3.10	4.3.4							*	*	
43.	Overall Test Program (R&QA participation in development, review for R&QA impact, verification, recommendation for revision based on R&QA analysis, and Test/Reliab./Quality relationship).	1.3 2.3 3.2 3.3 6.2	(a) !!!(A)		10.3 10.6.2 12.1	2.2.3u 2.2.5j 2.2.7e 2.3.2a (3) 2.3.10	1.3.2 3.3b 3.5a Sect. 4	1.4 2.1 4.2.1 12.2			*	*	*	*	*	*
43A.	Development Testing	3.4	(a) 111		10.6.6 12.4.1			4.3					*	*	*	

					AU	THORITY					HARDW	ARE	DEVEL	OPME	NT PH	ASE	
I TEM	REQA PROGRAM DISCIPLINE	NPC 500-10	NPC 400 Para. 1.5106	NPC 400 Subpart 50	NPC C500	NHB 5300,1	NPC 250-1	NPC 200-2	NPC 200-3	STUDY	DEFINITION	DESIGN	DEVELOPMENT	MANUFACTURING	TEST	OPERATIONS	SUPPORT
438.	End-Item Acceptant : Testing	3.8	(a) III (C)		10.6.3 10.6.6 12.4.4	2.2.3s 2.2.41 2.2.40 2.2.5e		4.3 7.3 7.4	3.6					*	*		
43C.	Qualification Testing	3.6	(a) III (B)	1,5005	10.6.6 12.4.2	2.2.3t 2.2.3v 2.2.4j 2.2.4m 2.2.5c 2.2.5g 2.2.6e 7.4.6	3.9.4	4.3			•			*	*		
43D.	Reliab. Demonstration Testing	2.4.4 3.7			10.4 10.6.6 12.4.3	2.2.3v 2.2.4k 2.2.5d	4.3.4							*	*		
43E.	Pre-use checkout of GSE & Pre-launch Checkout of Flt. Hdwr.	3.9, 3.10			10.6.6 12.4.4 12.4.5	2.2.5f 2.2.6b 2.2.6d 2.7									*	*	
43F.	Flight Testing	Sect. 4			12.4.7 12.4.8							-				*	
43G.	Post-Flight Testing	3.11			10.6.6 12.4.6			,								'n	
44.	Acceptance Criteria and Procedures; Reviews (including narrative end-item reports)	3.8	(a) 111		10.6.7	2, 2, 3s 2, 2, 4f 2, 2, 41 2, 2, 4o 2, 2, 5e 2, 2, 6e	3.2.1 3.5a 3.9.3 4.3.3	5.1 7.2 7.3.1 7.4.2.2	3.6			*	*	*	*	*	
45.	COFW (REQA Participation)	2.4.5 3.3.6			10.6.7 12.1	2.2.4p 2.2.5i								*	*		
46.	Safety (Industrial & Flight) (R&QA)	,			10.2.4 10.6.8 11.2.1	2.2.2c 2.3.1	3.5			*	*	*	*	*	*	*	